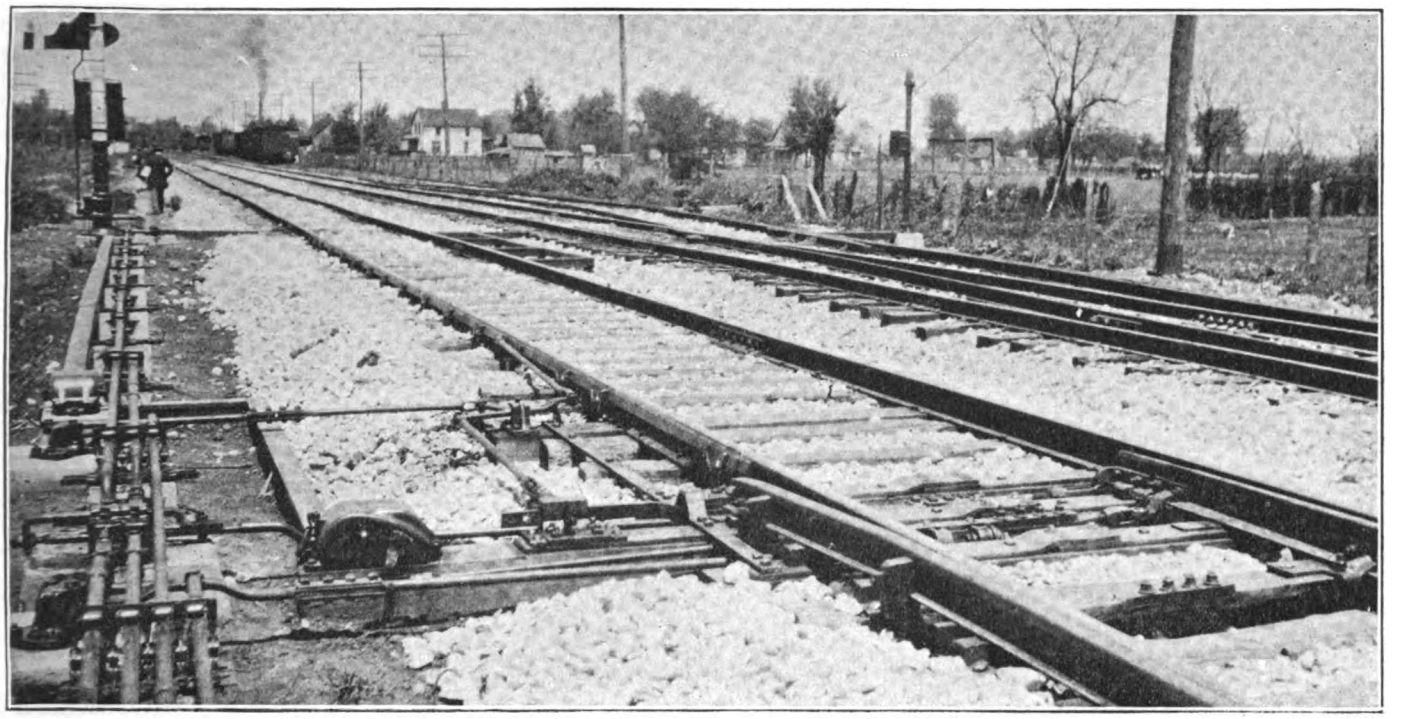


A Derail Location Showing the Two Switch Circuit Controllers Used for the Control of the Home Signal

New Mechanical Plant on Chicago & Alton

An Interlocker on a Double Track Main Line, Crossing Single Track Road, So Designed That No Night Leverman Is Required

THE Chicago & Alton recently completed a mechanical interlocking plant at the crossing of its lines with the Chicago & Illinois Midland, at a point about one-half mile south of Auburn, Ill., Station. The Chicago & Illinois Midland is a single track road and the line formerly ended at Auburn east of the Alton tracks, but has since been extended west to connect with the Chicago & North Western at Compro, Ill. The Illinois Public Service Commission required that an interlocker be built at the point of crossing. The Chicago & Alton drew up the necessary plans, ordered the material and installed the plant, with company forces. In the development of the plans it was decided that, as under ordinary conditions, the Chicago & Illinois Midland operated few or no trains at night, the plant could be so installed as to not require the services of a night man.

Through this territory the Chicago & Alton is completely equipped with double track automatic block signals of the normal danger type. The home and distant signals on the Alton are of the low voltage power type and the circuits for these signals are so designed that when the plant is lined up for the Alton the signals will operate as automatics, the locking being omitted between the home signals and the backup dwarfs. The power signals on the interlocking are of the three-position, upper quadrant, normal clear type.

Interlocking Tower

The tower consists of a two-story wooden frame building 12 ft. by 26 ft., with an outside wood stairway leading to the second floor. The roof framing for the tower consists of 2-in. by 6-in. timbers spaced on 18-in. centers. The roof is of black Bangor slate fastened to 1-in. by 10-in. boards. Gutters and spouting are of galvanized iron. The sides of the tower were covered by 1-in. by 12-in. sheeting, which was placed on diagonally and covered with single ply tar paper, 5-in. siding being put over this. The ceiling consisted of ¾-in. clear matched and beaded yellow pine. The second story was finished in clear yellow pine, ceiling and walls in ¾-in. by 3½-in. matched and beaded, this being placed vertical below the window sills and horizontally above. A 24-in. scuttle was placed in the ceiling. Bronzed hardware was used throughout. In connection with the flooring of the tower the sub-floor consists of 1 in. rough matched pine and the finished floor consisted of 1¼-in. by 4-in. clear S. 1 S. maple, which was laid after the machine was in place.

The battery cupboard and supply and tool closets were built in at the time the tower was constructed. The battery cupboard consists of S. 4 S. pine shelves, top, bottom and ends, 1½ in. material with strap hinges, hasps and staples used. This battery cupboard is 5 ft. high by 12 in. wide. The supply and tool closet was made out of the same class of material as was the battery cupboard and is 1 ft. deep by 6 ft. high by 4 ft. 6 in. wide. The tower painting consisted of three coats of the railroad standard grey building paint for outside and inside purposes. The second story had three coats of oil finish with the exception of the floor.

The tower is on a concrete foundation and the first floor is of concrete. This floor of the tower is flush with the top of the leadout supports. One feature in the construction is the installation of a pit for the full length of the machine, this being 3 ft. wide by 7 in. deep by 16 ft. long, and extends under the plates supporting the

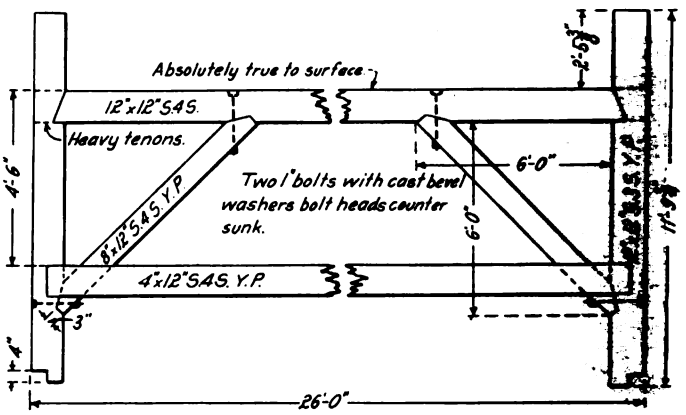
leadout so that easy access may be had to the bolts used for bolting down the rocker shaft bearings to the iron plates supporting them. This pit is provided with two drain pipes consisting of one-inch pipe extending through the foundation, necessary slope having been given to these pipes in order that proper drainage could be obtained.

The Machine and Leadout

The interlocking machine was furnished by the General Railway Signal Company and is of the improved Saxby & Farmer type. The machine consists of a 36-lever frame, with 24 working levers, four spare levers and 8 spare spaces. Of the 24 working levers 1 lever operates two switches, 6 levers operate six derails, 7 levers are used for 8 facing point locks and 13 bars, 6 of these bars being crossing bars. Two levers operate two dwarf signals, 6 levers are used for 6 high signals and 2 are used for the low speed or callon arms. The locking is so designed that conflicting routes are locked up by the derail levers, which is the C. & A, standard method of locking.

The leadout is of the rocker shaft type. Two-in. square rocker shafts of 9 ft. length are used and these are supported by R. S. A. type rocker shaft bearings 15 in. high, which are set on 1 in. by 6 in. by 16 ft. iron plates. Three of these plates are used. These plates are in turn supported by 5 80-lb. rails 10 ft. long, embedded in concrete walls 1 ft. thick at the top and battering down to 2 ft. at the bottom with a depth of 5 ft. Two of these walls and the tower foundation on the track side are used, the tower foundation on the track side acting as the center support. The iron plates supporting the rocker shaft bearings are fastened to the rails by ¾-in. by 6-in. long beveled plates to fit the base of the rail. These in turn are bolted by 2 ¾-in. bolts per plate. The rocker shaft arms are 11¾ in. long and are connected to 1 in. up and down rods. Lengths of pipe equal to the thickness of the concrete tower foundation were used on the track side of the tower for the rocker shafts to pass through. As seen in the illustration, two sets of these were installed, one row being six inches above those through which the rocker shafts pass. This will allow the leadout to be raised to conform to a track change at a later date.

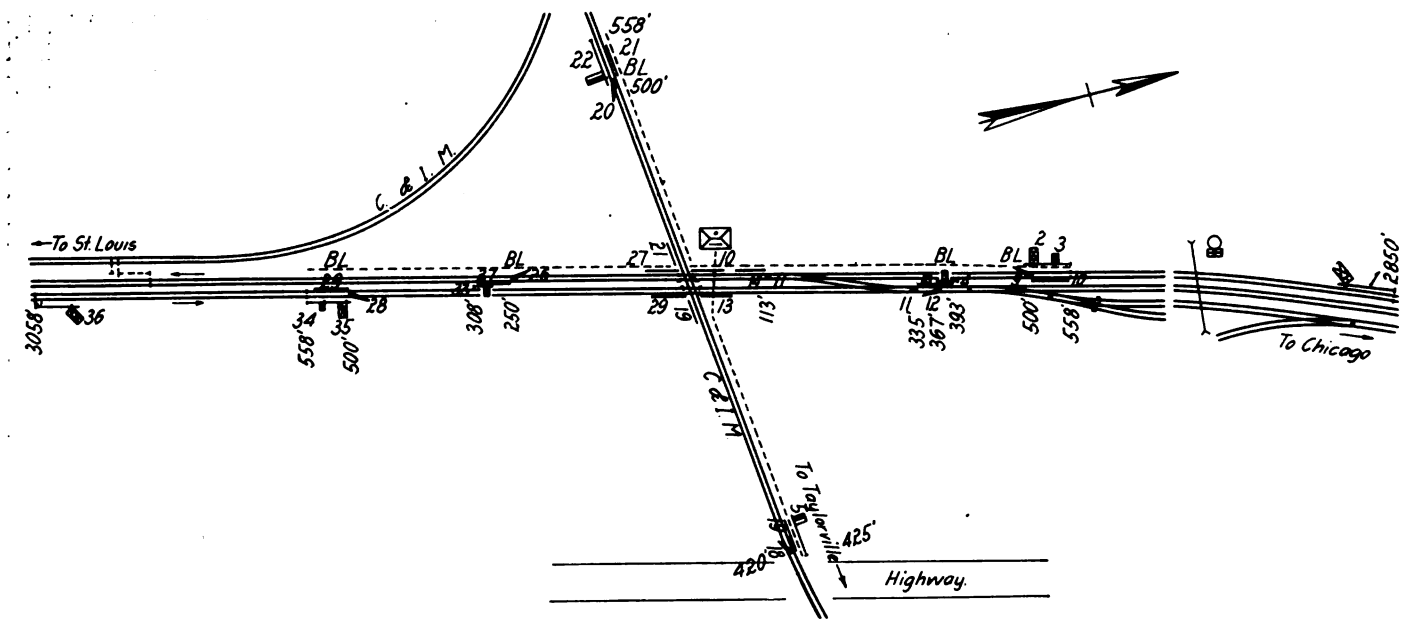
The pipe carriers for the up and down rods are mounted on an iron plate ½ in. by 3 in. by 15 ft. with ½ in. by 1¼ in. carriage bolts. This plate is supported to the cross piece of the machine frame by three Z bars, the web of which is ½ in. thick, 5 in. high, with 3-in. faces. The wrought pipe carriers on the leadout are mounted on ½-in. by 3-in. by 60-in. iron cross plates, which are in turn bolted to the leadout plates. The machine frame support consists of 12-in. by 12-in. yellow pine timbers for the ends and machine support. The braces for the frame consist of 8-in. by 12-in. yellow pine. The construction of the frame is illustrated in the drawing.



The Construction of the Gallows Frame

The Pipe Line

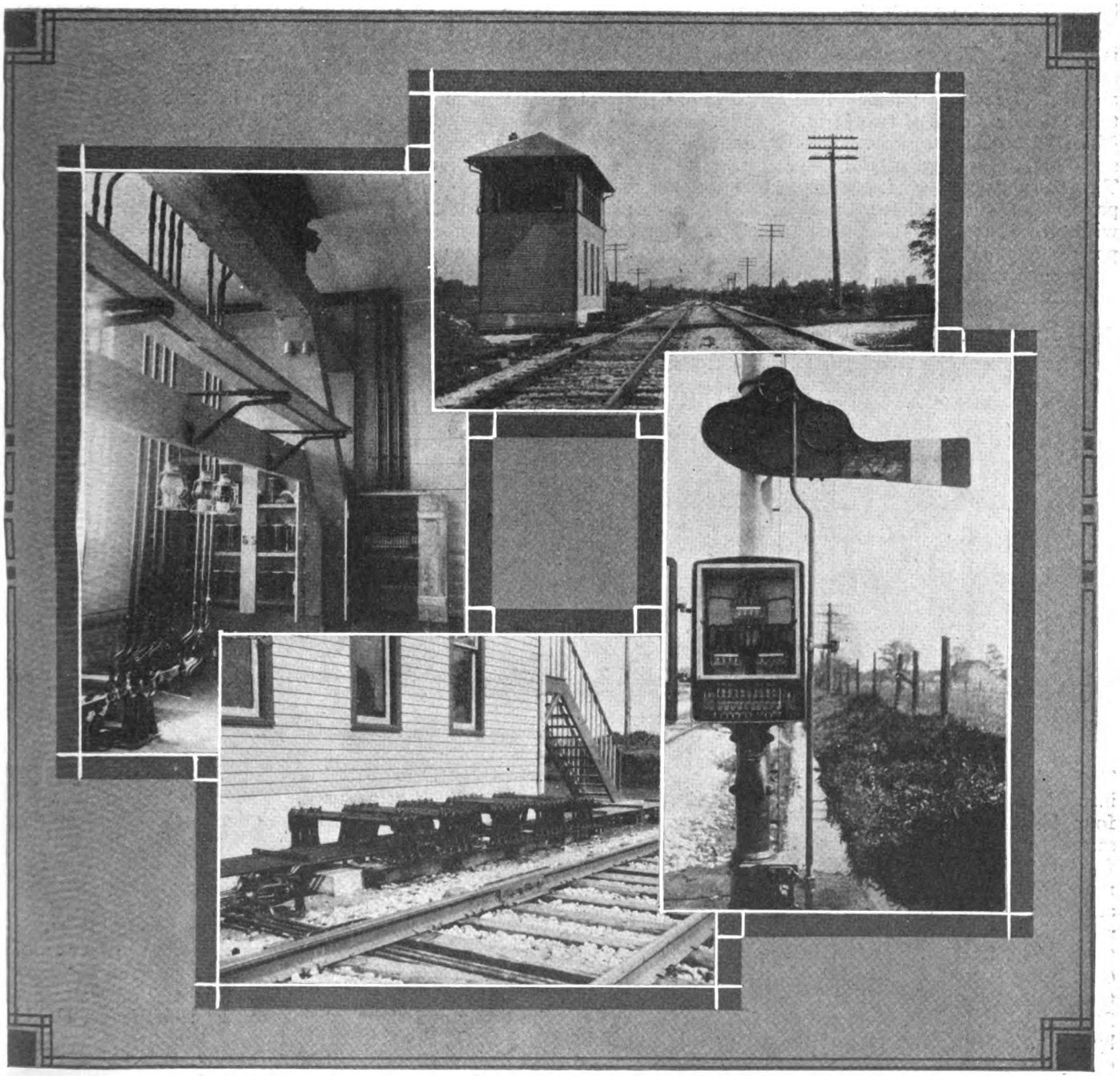
All functions on the plant are pipe connected. The pipe used is galvanized wrought, single strength pipe. The pipe line run on the Alton is located on the west side of the track and the nearest pipe is 65 in. from the gage of rail. The run on the Chicago & Illinois Midland is located to the north of the track and the nearest pipe is 52 in. from the gage of the rail. The compensation for the plant was accurately measured. The temperature at the time the pipe was cut in was noted and the compensation was handled in accordance with the Railway Signal Association table.



Track Plan Showing Signal and Derail Layouts and Pipe Line Run

Concrete pipe carrier foundations are used for the support of the pipe line, these foundations being 8 in. by 12 in. by 24 in. Universal pipe carriers are used and these are mounted on Kenly bases with ½-in. by 1¼-in. carriage bolts, no washers being used on the carriage bolts. The Kenly pipe carriers are mounted on the concrete foundations with ⅝-in. by 17-in. hook bolts having a 2-in. hook on the end and ⅝-in. cut washers are used in connection with these hook bolts. One concrete foundation is used to support a maximum number of 8 pipes. For any number above 8 two foundations are used. At all locations where it is necessary to have offsets in the pipe line this is made with 1¼-in. solid round iron. The pipe line is supported by transverse carriers at the points where it crosses under the tracks, there being a maximum number of 7 pipes in a tie space. Three-way separate pin cranks are used in making the turns at the point where the pipe line branches from the main run to extend along the tracks of the Chicago & Illinois Midland.

North and south of the tower on the Alton the pipe line has been carried under road crossings by means of 2-in. galvanized pipe set in concrete. This concrete support is 30 in. wide by 14 in. deep by 21 ft. long. No stuffing boxes are used at the ends of the 2-in. pipe, but the center of the 2-in. pipe is ¾ in. higher than either end. This is to allow for proper drainage and to prevent the accumulation of water in the pipes. No selectors are used on the plant nor is any boxing or covering of any kind to be found about the pipe line or functions. A turnbuckle is located in each pipe line near the function and 4 bolt pipe line insulations are used wherever it is



First Floor Layout

The Tower Location

A View of the Leadout

Relay Box and Call on Arm

necessary to prevent shorts on the track circuits. After the pipe line was installed it was painted with three coats of Lowe Brothers' metal coat paint.

Switch and Derail Fittings

All derails are of the Wharton type. The switches and derails on this plant are all equipped with facing point locks and bars. The switch and derail points are adjusted for a 5-in. opening at the points. The pipe lines have 8¾ in. throw. Of the special ties used, the head tie is 10 by 10 in. sawed and chamfered and no framing is necessary. The other special ties are 8 in. by 10 in. sawed ties. The tie supporting the T crank is set 6 ft. ahead of the switch points. The T cranks are fastened to the ties by means of two ¾-in. by 12-in. bolts and two ¾-in. by 6-in. lag screws. The facing point locks are set 31 in. from gage of rail to center line of the lock. Two toe plates are used, one on each side of the facing point lock casting and these are riveted to the tie plates with two ¾-in. rivets for each toe plate. The facing point lock is located on the head tie.

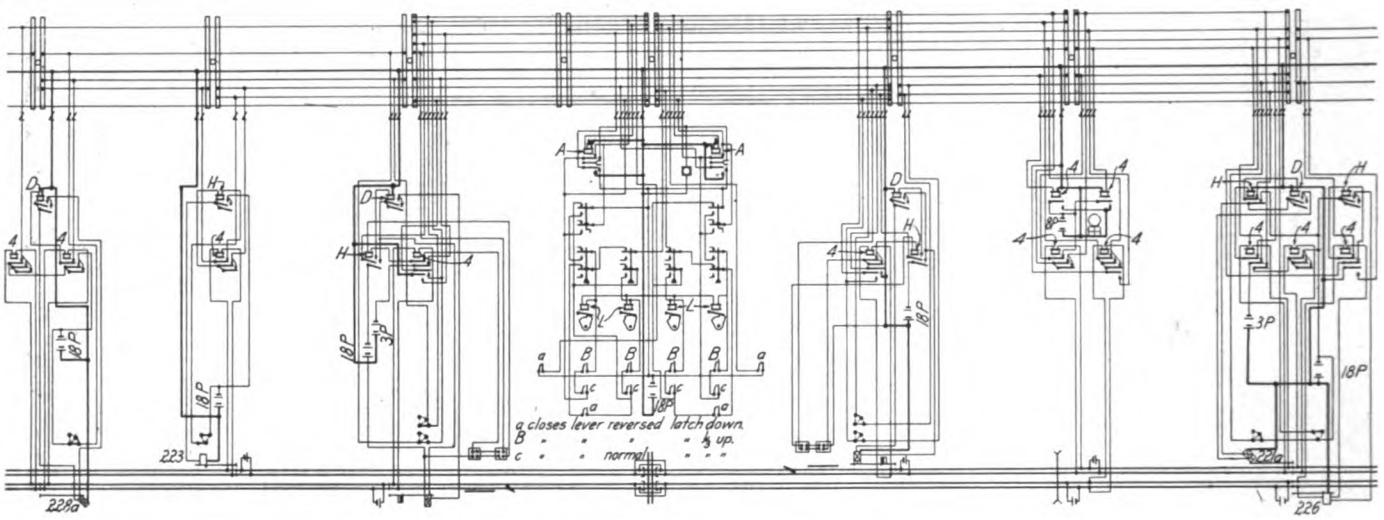
Three insulated tie plates are used for each layout. These tie plates are ¾ in. by 6 in., having a lap joint insulation, the two pieces being riveted together with four ¾-in. rivets. There are two ¾-in. by 6-in. lag screws used to each tie place between the rails for fastening it to the tie. Six ¾-in. wrought rail braces are used on all switches and four are used on all derails. These rail braces are of the non-adjustable type. Each rail brace is fastened with three ¾-in. by 6-in. lags and in addition two ¾-in. by 6-in. lags are used at each end of the tie plates for fastening them to the ties. The tie straps are of ¾-in. by 2½-in. material 10 ft. long and are fastened to the ties by ¾-in. by 6-in. lags, two of these lags being used in each plate tie and end tie and only one used for the intermediate ties. The switch adjustments used are the open type, none of the housing types being in use on this plant.

The detector bars are ½ in. by 53 ft., equipped with 17 motion plate clips to the bar. These clips are attached to the rail by means of hook bolts, as it was felt the bar could be kept in better adjustment when the rails run than would otherwise be the case were the clips attached by means of bolts to the web of the rail. The driving pieces are 7 ft. long and consist of solid 1¼-in. round iron.

The conditions on the plant are such that good drainage exists around all functions and it has been unnecessary to make any special provision to take care of this feature of the work. Rock ballast extends throughout the limits of the plant. All crank foundations are 20 in. by 20 in. at the top and batter out. These foundations are 5 ft. deep. The compensator foundations are of the R. S. A. standard size with the exception that they are 5 ft. deep. These foundations were all made extra deep in order to obtain a more solid foundation for the cranks and compensators, as it was felt that better maintenance results could be obtained.

Signals and Wiring

The high signals are of the G. R. S. model 2A low voltage type and are three-position on the Alton, while on the Chicago & Illinois Midland they are two-position, operating from 0 to 90 deg. The callon arms are mechanically connected and operate in two positions only from 0 to 45 deg. The dwarf signals are of the spring type upper quadrant and operate from 0 to 45 deg. All signal foundations conform to the Railway Signal Association standards and all signals on the plant are bolt



The Arrangement of Signal Circuits Through Auburn Interlocking Plant

locked, the General Railway Signal Company's multiple unit bolt lock being used. The circuit controllers are located on the locking bed of the machine and operate in connection with signal levers 1 and 36. Two half reverse locks are used in connection with levers 2 and 35 and two full reverse locks are used in connection with levers 10 and 29.

Okonite wire is used throughout the plant. The track wires are No. 9 with 4/64 in. wall, while the wires used from signals to switch boxes and through trunking across the tracks is No. 12 B. & S. G. with 4/64 in. wall. For the tower and signal wiring and in cable drops, No. 14 B. & S. G., S. Q. copper wire with 3/64 in. wall is used. All line wire consists of No. 10 H. D., D. B. W. P., copper, and all crossarms are 10 ft. 10 in.

The wiring from the pole line of the tower is carried from the junction pole under the tracks in 3-in. conduit, which terminates in the terminal box inside the tower. This conduit is carried to the top of the junction pole. Two lines of 3-in. conduit were used, one being for the telegraph department, but this is not in use at present. These conduits were brought up through the wall of the tower foundations and concreted into the terminal box. The interior wiring of the tower is carried through three runs of 2-in. conduit; one line of conduit goes to the locks, one to the releases and one to the annunciators.

The wiring between the locks is carried in 1¼-in. conduit. The annunciators are of the G. R. S. model 9 type with small semaphore blade and are located in the center of the tower in front of the machine and above the windows. All track relays are of 4 ohm resistance, while the line relays are of 670 ohms resistance and are of the Hall gauze point type.

The approach locking is so arranged as to become effective at a point 2,500 ft. in advance of the distant signal and keeps the plant locked up until the engine passes the home signal, when the relay controlling this locking is opened up. The crossing is protected by crossing bars and no route locking is used on the plant, as it was installed with the primary purpose of being lined up for the Alton during the night with no leverman in attendance. As stated in the first part of the article, the locking is so arranged that both the dwarf and high signals on both tracks of the Alton are cleared at night, and the high signals act as an automatic signal. When it is necessary to use the callon arms the automatic feature is cut out. All batteries used are of the B. S. C. O. type in heat-resisting glass jars. The Bryant Zinc Company's adjustable resistance units are in use, as are also their Premier No. 3 lightning arresters. The grounds consist of one-inch galvanized solid rod 11 ft. long with a No. 8 bare copper wire bonded and soldered to the rod. All bond wires used are 48 in. long galvanized E. B. B. Continuous insulated joints are used throughout on the plant. At home and distant signal locations Potter-Winslow 60-cell capacity concrete battery wells are employed and 18 batteries are used at each home and distant signal location and in the tower.

One very interesting feature in connection with the operation of the home signals is the design of their control circuits. In this connection two switch boxes are used and both common and the positive control wires break through these boxes in series. Two switch boxes are used for each home signal. One is placed in such a position that it is operated by the derail point and the other one is operated by the pipe line and bolt locked with the derail. Thus when the circuit is broken through the switch circuit controllers both sides of the control relay are open.

The 45 to 90 deg. control relay is fed from battery at the advance signal, which is of the normal danger type. The advance signal clears through a back contact in the annunciator, and is held in a clear position through this contact and through a back contact of the track relay in advance of the home signal. The 45 to 90 deg. position of the home signal is controlled through the circuit breaker of the model 2A mechanism on the advance signal. This plant was installed by the company forces of the Alton, S. U. Rhymer, general signal inspector, being in charge. All plans and work was under the directior of G. W. Hulsizer, superintendent of telegraph and signal engineer of the Chicago & Alton.

Railway Signal Practice on French Lines*

By J. G. Porter, 13th Engineers, A. E. F.

SIGNALING in France is practically in its infancy, when compared with that in the States. Interlocking is almost entirely mechanical, although occasionally a few semi-automatic signals are included within the limits of the plant. The majority of the signals are of a square target type, pivoted horizontally in the center. With the lever in the reverse position, the target lies horizontally face upward and displays a white light and red marker at night. The day indication for "Stop" is given by the square target in the vertical position. The home signal target has the second and fourth sectors painted red. At night the signal in this position shows two red lights, given by a lamp very similar to the double lens lamp used on the Chicago & North Western. Both the target and the lamp have one red and one white lens, but in the opposite position. Thus, in the "Stop" position, both lights are red, while in the "Clear" position, the left hand light only is red, which serves as a home signal marker for the white light on the right. All signals are wire connected and as there are no bolt locks or exact adjustments the positions often vary, and would prove far from satisfactory on any American road. The targets are mounted on iron poles at various heights to suit local conditions. At points where several routes diverge, three and four targets are often mounted on the same pole. All targets are of wood and home signal targets are heavily weighted on the bottom in order to keep the wire line by which they are operated tight and in good operating condition.

Distant signals have the second and fourth segments painted green instead of red, and the night "Caution" indication is given by two green lights. The night indication for "Clear" is a white light and green marker to the left. Most distant signals are semi-automatic with a spring feature to provide correct position, which will be described later. The same type lamp is used on the distant signals as on the home, with the difference of a green lens substituted for a red.

Train order signals are of a semaphore type, with an arm about six feet in length, shaped like a paddle. The outer frame is made of half-inch tubing and the body is a basket-work of one-inch metal straps, about one-sixteenth inch in thickness. These signals are not included in the plant and are sometimes operated from a ratchet-wheel on the wall of the tower. In this case, the blade is placed at the corner of the building itself at about the second-story line. Frequently the blades are placed on a high mast just outside the tower and are operated by a small wall lever stand. Train order signals on double track under ordinary circumstances are placed on the left-hand side of the track, as the French practice is to run trains left-handed. Neither dwarf signals nor derails of any type are ever used.

Interlocking Towers and Machines.

Tower buildings are very similar to the ordinary tower in the States. The lower floor is taken up with the usual paraphernalia of tools and supplies. The machine, locking, bed, leverman's desk, phones, annunciators and indicators are on the second floor. Except

*On account of suspicion being provoked against anyone desiring very exact information as to details and practices in construction and operation of the railroads in a military sector, some points in this article may seem rather vague. Censorship necessitates treating the subject in a rather broad and indefinite manner in order that no information as to locality will be given. The many narrow-gauge lines and the military roads that have been built by the different allied nations, since the beginning of the war, were not considered in this article.—Editor.